ATTACHMENT 8

Aquarobic Mini-Plant, & Filter Bed Total System Notes GMP #105

The Aquarobic International, Inc. Proprietary Mini-Plant$_{tm}$ and Raised Filter Bed disposal system are sold and warranted as a package system. The system uses an application rate to the top of the filter bed of 4 gal/Sq.Ft./day for residential systems with flows of up to 1,500 gpd. For commercial, industrial and residential systems in excess of 1,500 gpd. Use a filter bed loading rate of 2.5 gal. /Sq.Ft./day.

The Filter Bed System is designed to take advantage of the very high degree of treatment of the effluent from the Mini-Plant$_{tm}$ (7-BOD$_5$, 11 mg/l SS and 5 mg/l DO.)

The rate of percolation on the top 12" of ground material immediately below the mantel and contact area.

The capillary or wicking action of the 12" of mason sand material on the contact and mantel area. The additional photosynthesis that the Kentucky 31 tall Fescue grass with its broad leaf and very long root system (18"+) takes up.

The plants that are planted on the contact and mantel area, (evergreens, willow trees etc.) Take up considerable water amount of water and helps to aerate the soil. The system improves with age as the vegetation becomes more established. <u>The Aquarobic filter bed systems, dimensions and construction must be as designed by Aquarobic to be fully warranted to work properly by Aquarobic International, Inc.</u>

The single batch "Sequential Batch Reactor" (SBR) Mini-Plant$_{tm}$ pumps daily the total treated effluent to the top of the filter bed once a day. It pumps from 5:00 am to 6:00 am to a pressure distribution grid (4" perforated pipe). The Mini-Plant pumps the total daily load in 60 minutes to ensure even distribution. The distribution grid is to be placed level, on 15" centers in 12" of washed 1/2 to 3/4 inch stone on top of the 30" of filter material. (see drawing)

Aquarobic Mini-Plant, & Filter Bed Total System Notes GMP #105

The maximum size of the top surface of the filter bed mound is to be no larger than 600 Sq/ft. (2400 gpd.) If a larger area is needed, multiple beds must be used, separated by a minimum distance of 15' using a common contact and mantle area.

- **The side slopes of the filter bed must be 3:1. (For every Foot up three feet out)**

- **The Aquarobic filter media must be a filter material approved by Aquarobic International Inc. Which has an effective size of 1.0 to 10.0 millimeters, uniformity co-efficient less than 5.0, and dust content less than 0.5 %. The filter material must be a minimum of 30" depth.**
  (See drawings)

- **The contact and mantle area is to be cut into the ground when possible (level + or -1"), and back-filled with a minimum of 12" of a sandy material, 0.5 to 1.5 mm sand, i.e., Mason Sand or #2 Torpedo Sand, (FA1->FA8).**

- **On land that has a slope to it, and the separation distance requirements to the limiting zone will not allow to dig down to level the area, it will be necessary to import fill material to level the mantel area, from soil group III or IV approved by Aquarobic in writing, to level the area.**

- **The footprint of the filter bed portion is to be placed on the leveling material, never remove the original earth under the footprint of the Bed to replace it with imported fill material.**

- **If the high ground water table, gray modeling or limiting zone to rock is only 12" inches from the surface of the original soil, the system can be place at grade but a 12" + mound (berm) of clay material around the perimeter of the contact and mantle area must be constructed and have a minimum of 3 to 1 side slope.**

The mounds (berm) around the contact and mantel area:

- **Once the berm is in place, then the 12" of mason sand, for the mantle and contact area can be installed. Then the 30" of filter media, and its 3-1 sides slopes, creating the footprint of the filter bed is installed, then the distribution piping is placed in a 12" layer of 1/2" to 3/4" gravel above the 30" of filter media and covered by 6"to 8" of loam top soil over the mount and 2" loam top soil over the mantel area, the filter bed system may be installed on soils with percolation of less than 250 minutes per inch with this design minimum:**

  - **The contact and mantle area shall be at least as wide to equal the foot print of the filter bed material**
  - **Mantel and contact area extending for a minimum of 50' from the outer distribution pipes in the direction of flow. (The direction of flow is created by the excavation or the berm.)**
  - **All other separation distances (IE: Well, property line, buildings, etc.) Shall be measured from the toe of the filter bed. (See drawings)**

For percolation above 120 min. / inch the contact and mantle area is sized by the

Formula: A = QT/25

- **A = Area in sq./ft**
- **Q = Quantity of wastewater produce per day in us gal.**
- **T = The percolation time of the original ground, in min/inch (of the top 12" of the ground immediately under the mantel, contact mason sand).**

- **Regardless of the formula, the total application rate to the Contact and Mantel area must not exceed 0.20 gal/Sq./ft/ day. (See drawings)**

The placement of sod over the filter bed mound to hold the soil from eroding until the Kentucky 31 tall fescue becomes establish (the mound area only) is a required part of the Aquarobic Innovative, proprietary, total Mini-Plant and filter bed System. During late fall or early spring, when sod may not be available, the filter bed may be seeded and a soil retention cloth material or Hydro-seeding may be used to keep the soil from eroding until sod becomes available or the Kentucky 31 tall fescue establishes itself. The mantle area must be seeded using Kentucky 31 tall fescue which is a grass with a broad leaf and 16" to 18" root system.

The single batch SBR Mini-Plant$_{tm}$ tanks are sized to have three (3) times the daily wastewater flow for residential use (including the use of garbage disposal). Commercial or industrial systems shall have a Minimum tank size of four (4) times the daily wastewater use. (When using concrete tanks, multiple tanks may be used to achieve the required volume, if the tank were interconnected according to Aquarobic specifications).

The discharge pump from the single batch Mini-Plant$_{tm}$ is sized to pump the total volume of the daily effluent to the filter bed in 60 minutes. Therefore, the pump size is determined by the treatment capacity, distance, and elevation to the Filter Bed of each Mini-Plant$_{tm}$ Filter Bed System. The total daily effluent volume is pumped to the manifold in the filter bed in 60 minutes as stated above; there by creating a pressure distribution discharge system, although the distribution pipe manifold is 4" in diameter.

The Mini-Plant is an integral component of the total Aquarobic Filter Bed System, the Mini-Plant is a miniature advance wastewater treatment system which treats domestic wastewater (Influent from 100 to 400 mg./Liter BOD^5 "Biochemical Oxygen Demand" and SS. "Suspended Solids") from homes, offices, businesses, and many other applications.

Aquarobic Mini-Plant, & Filter Bed Total System Notes GMP #105

The Mini-Plant$_{tm}$ provides a reduction in pollutants to a degree of treatment equal to or better than a modern municipal sewage treatment plant. It produces 7 mg/L BOD^5 & 11 mg/L SS.)

The Mini-Plant has the capacity to treat up to 5,000 US. Gpd the National Sanitation Foundation International, (N.S.F.I.) under standard # 40 only list units up to 1,500 gpd. Only for domestic waste from a single family home.

The Aquarobic Mini-Plant$_{tm}$ is available in our custom manufactured Fiberglass tank, or as an add on kit, to be installed onto locally manufactured one compartment concrete tank(s) of the write size. All Mini-Plant $_{tm}$ tanks are sized to hold (3) three times the daily wastewater flow for residential units and (4) four times the daily wastewater flow for commercial installations, thus, providing 100% or more overload capacity. Which gives the Mini-Plant$_{tm}$ the ability to handle the occasional shock load.